

## **1997 Chevrolet S10 Pickup**

**ANTI-LOCK BRAKE SYSTEM 1997 BRAKES General Motors Corp. - Anti-Lock - 4WAL**

### **ANTI-LOCK BRAKE SYSTEM**

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## **DESCRIPTION**

The Kelsey-Hayes 4-Wheel Anti-Lock (4WAL) brake system is used to prevent wheel lock-up during heavy braking. This allows driver to maintain steering control while stopping vehicle in shortest distance possible. The system consists of Brake Pressure Modulator Valve (BPMV), Vehicle Speed Sensor (VSS), Powertrain Control Module (PCM) or Vehicle Control Module (VCM), Wheel Speed Sensors (WSS), warning lights, electrical wiring and hydraulic lines.

The Electro-Hydraulic Control Unit (EHCU) is the entire unit, including the BPMV, Electronic Brake Control Module (EBCM) and combination valve. The EBCM is the electronic control portion of the ABS assembly. It is mounted on top of the BPMV located on left side of engine compartment, above fender well.

## **OPERATION**

When ignition is turned on, Yellow ANTI-LOCK and Red BRAKE warning lights will illuminate for 2 seconds as a bulb check. VCM performs a self-check of the 4WAL system, once each ignition cycle, when vehicle speed reaches 8 MPH. If faults are detected by VCM, ANTI-LOCK light will illuminate (in most cases) and 4WAL functions will be disabled while ANTI-LOCK light is on. A related Diagnostic Trouble Code (DTC) will be stored. The Red BRAKE light illuminates if parking brake is applied or a mechanical brake problem is detected.

When brake pedal is depressed, brake switch voltage to VCM drops from 12 volts to one volt. At this point, VCM monitors wheel speed through an AC signal generated by speed sensors located at each wheel. If the deceleration rate of wheel speed reaches a preprogrammed rate, PCM/VCM will activate various control valves to prevent wheel lock-up by increasing or decreasing hydraulic pressure to each channel: left front, right front or rear wheels.

## **BLEEDING BRAKE SYSTEM**

### **ABS BLEEDING PROCEDURE**

**NOTE:** **Bleeding ABS system requires the use of Tech 1 scan tool. An assistant is required when performing bleeding procedures.**

1. Raise and support vehicle. Begin bleeding at right rear wheel. Install a clear plastic hose to bleed screw. Immerse other end of hose in container that is partially filled with clean brake fluid.
2. Open bleed screw 1/2 to 1 full turn. Have assistant slowly depress brake pedal until it reaches full travel. Hold pedal until bleed screw is closed. Release brake pedal and wait 10-15 seconds. Repeat until clean bubble-free brake fluid is present at wheel bleed screw.
3. Check master cylinder fluid level every 4-6 strokes of brake pedal to avoid running system dry. Repeat steps 2) and 3) on left rear, then right front, then left front. After bleeding all 4 wheels, go to next step.
4. Using scan tool in FUNCTION TEST, run FUNCTION TEST 4 times consecutively while applying the

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brake pedal firmly. Release brake pedal between each test.

5. Rebleed all 4 wheels using steps 2) and 3) to remove remaining air from brake system. Ensure brake pedal feel is appropriate before attempting to drive vehicle. Rebleed as many times as necessary to obtain appropriate pedal feel.

## DIAGNOSIS

**NOTE:** When testing and diagnosing 4WAL system, use of Tech 1 scan tool is required.

The Vehicle Control Module (VCM) contains a self-diagnostic capability to detect system failures. When a DTC is set, the VCM may disable 4WAL system and illuminate ANTI-LOCK light for duration of ignition cycle. DTCs stored by VCM can be displayed using Tech 1 and appropriate cartridge.

Before diagnosing 4WAL system, perform a comprehensive visual inspection of system by checking wiring harness connectors, harness routing (pay particular attention to wheel speed sensor wiring harness routing), applicable fuses in fuse block, and ground connections. Ensure brake fluid level in master cylinder reservoir is full.

Start 4WAL system diagnosis using **DIAGNOSTIC SYSTEM CHECK**. If failures are found when performing diagnostic system check, you will be directed to enter diagnostics to retrieve DTCs or perform SYMPTOM TESTS. **DIAGNOSTIC SYSTEM CHECK** may indicate that system is functioning properly.

### RETRIEVING DTCs

Connect Tech 1 scan tool to DLC located under steering column. Access 4WAL brake DTCs. Repair DTCs in the order they appear. See **4WAL DIAGNOSTIC TROUBLE CODE (DTC)** table for diagnosis. Before diagnosing DTC(s), perform **DIAGNOSTIC SYSTEM CHECK** first.

### 4WAL DIAGNOSTIC TROUBLE CODE (DTC)

DTC	(1) Definition
<b>C0021</b>	Right Front Wheel Speed Sensor Circuit Open Or Shorted To Battery Voltage
<b>C0022</b>	Right Front Wheel Speed Sensor Signal Missing
<b>C0023</b>	Right Front Wheel Speed Sensor Signal Erratic
<b>C0025</b>	Left Front Wheel Speed Sensor Circuit Open Or Shorted To Battery Voltage
<b>C0026</b>	Left Front Wheel Speed Sensor Signal Missing
<b>C0027</b>	Left Front Wheel Speed Sensor Signal Erratic
<b>C0029</b>	Simultaneous Dropout Of Front Wheel Speed Sensor Signal
<b>C0035</b>	Rear Speed Sensor Signal Circuit Open Or Grounded
<b>C0036</b>	Rear Speed Sensor Signal Missing
<b>C0037</b>	Rear Speed Sensor Signal Erratic
<b>C0038</b>	Wheel Speed Signal Malfunction
<b>C0041</b>	Right Front Isolation Solenoid Circuit Open
<b>C0042</b>	Right Front Dump Solenoid Circuit Open

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<u>C0043</u>	Right Front Isolation Solenoid Circuit Shorted
<u>C0044</u>	Right Front Dump Solenoid Circuit Shorted
<u>C0045</u>	Left Front Isolation Solenoid Circuit Open
<u>C0046</u>	Left Front Dump Solenoid Circuit Open
<u>C0047</u>	Left Front Isolation Solenoid Circuit Shorted
<u>C0048</u>	Left Front Dump Solenoid Circuit Shorted
<u>C0051</u>	Rear Isolation Solenoid Circuit Open
<u>C0052</u>	Rear Dump Solenoid Circuit Open
<u>C0053</u>	Rear Isolation Solenoid Circuit Shorted
<u>C0054</u>	Rear Dump Solenoid Circuit Shorted
<u>C0065</u>	Pump Motor Relay Circuit Open
<u>C0066</u>	Pump Motor Relay Circuit Shorted
<u>C0067</u>	Pump Motor Circuit Open
<u>C0068</u>	Pump Motor Locked Or Pump Motor Circuit Shorted
<u>C0071</u>	EBCM Internal Fault
<u>C0072</u>	EBCM Internal Fault
<u>C0073</u>	EBCM Internal Fault
<u>C0074</u>	EBCM Internal Fault
<u>C0081</u>	Stoplight Switch Always Closed Or Shorted
<u>C0086</u>	Anti-Lock Indicator Light Circuit Shorted To Battery Voltage
<u>C0088</u>	Brake Warning Light Circuit Shorted To Battery Voltage

(1) Always perform **DIAGNOSTIC SYSTEM CHECK** before performing DTC tests.

### CLEARING DTCS

A DTC set in a current ignition cycle will not clear during that same ignition cycle. Cycle ignition switch off for 10 seconds and then on to clear a DTC set in current ignition cycle. If ANTI-LOCK light is staying on, DTCs can be cleared with a scan tool. Verify DTCs are cleared. See **RETRIEVING DTCS**.

### DIAGNOSTIC SYSTEM CHECK

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### System Description

The diagnostic system check is an organized approach to identifying a problem created by an ABS malfunction. It must be the starting point of any ABS complaint diagnosis because it directs to the next logical step in diagnosing the complaint.

Serial data is exchanged by EBCM through harness connector C1, terminal "F", and Class 2 data is exchanged through harness connector C1, terminal "G". EBCM is supplied switched ignition voltage through harness connector C1, terminal "A", and ground is provided through harness connector C1, terminal "J".

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### Diagnostic Procedures

1. Verify all EBCM connectors are connected properly. Install scan tool with proper cartridge. Turn ignition switch to RUN position. Using scan tool, select FO: DATA LIST. If data is being received from EBCM, go to step 7). If data is not received from EBCM, go to next step.
2. Observe scan tool. If scan tool displays WAITING FOR DATA, go to next step.
3. Ensure scan tool is properly connected to DLC. If connection is okay, go to next step. If not, go to step 5).
4. Turn ignition off. Remove and inspect 10A brake fuse. If fuse is open, go to step 11). If fuse is okay, go to step 6).
5. Reconnect scan tool to DLC connector and repeat step 1).
6. Turn ignition off. Install brake fuse. Disconnect negative battery terminal. Disconnect 10-pin EBCM harness connector C1. Check resistance between negative battery terminal and 10-pin EBCM harness connector C1 terminal "J". If resistance is 0-2 ohms, go to step 14). If resistance is not 0-2 ohms, go to step 17).
7. Using scan tool, select DTC(s). If DTC(s) are present, go to appropriate DTC test. If DTC(s) are not present, go to next step.
8. Turn ignition off for 10 seconds. Turn ignition switch to RUN position. If ABS warning light illuminates for 3 seconds, and then goes off, go to next step. If not, go to step 10).
9. Select DTC HISTORY. If DTC(s) are present, diagnose affected DTC(s). Go to DIAGNOSTIC TROUBLE CODES (DTC). If DTC(s) are not present, system is okay.
10. Observe ABS warning light. If warning light stays on, go to TEST "B" under **SYMPTOM TESTS**. If warning light does not stay on, go to TEST "A" under **SYMPTOM TESTS**.
11. Replace brake fuse. Turn ignition switch to RUN position for 10 seconds. Turn ignition off. Remove and inspect fuse. If fuse is blown, go to next step. If fuse is okay, go to step 19).
12. Disconnect 10-pin EBCM harness connector C1. Replace brake fuse. Turn ignition switch to RUN position for 10 seconds. Turn ignition off. Remove and inspect fuse. If fuse is blown, go to step 20). If fuse is okay, go to next step.
13. Inspect ignition and brake switch input circuits and 10-pin EBCM harness connector C1 for physical damage which could cause a short to ground with EBCM harness connector connected to EBCM. Repair as necessary. After repairs, reconnect all connectors. Turn ignition switch to RUN position for 10 seconds. Turn ignition off. Remove and inspect fuse. If fuse is blown, go to step 21). If fuse is okay, check for intermittent or poor connections.
14. Reconnect negative battery terminal. Turn ignition switch to RUN position. Check voltage between 10-pin EBCM harness connector C1 terminal "A" and ground. If voltage reading is 10-15 volts, go to next step. If not, go to step 22).
15. Turn ignition off. Disconnect positive battery terminal. Turn ignition switch to RUN position. Check resistance between positive battery cable and 10-pin EBCM connector C1, terminal "A". If resistance is 0-2 ohms, go to next step. If resistance is not 0-2 ohms, go to step 22).
16. Inspect EBCM and EBCM harness connector terminals for poor contact. Inspect battery terminals and battery cable terminals for poor connection. Repair as necessary. After repairs, go to step 24). If connections or terminals are okay, go to step 25).
17. Repair open or high resistance in EBCM ground circuit. See **WIRING DIAGRAMS**. After repairs, repeat step 1).

18. Repair short to ground in brakelight control circuit. After repairs, repeat step 1).
19. Check and repair short to ground in battery feed circuit. After repairs, install fuse and repeat step 1).
20. Check and repair short to ground in ignition input or battery circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, repeat step 1).
21. Replace EBCM and brake fuse. After repairs, repeat step 1).
22. Repair open in ignition input or battery circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, repeat step 1).
23. Repair open or high resistance in ignition input circuit or battery circuit to EBCM. After repairs, repeat step 1).
24. Replace terminals or repair poor connection. After repairs, repeat step 1).
25. Reconnect EBCM harness connectors and battery terminals. If communications cannot be established between scan tool and EBCM, try scan tool on similar vehicle with the same system to determine if scan tool is malfunctioning or if Class 2 data line is faulty. See appropriate WIRING DIAGRAM article. Repair or replace as necessary.

## DIAGNOSTIC TROUBLE CODES

### DTC C0021: RIGHT FRONT WHEEL SPEED SENSOR CIRCUIT OPEN OR SHORTED TO BATTERY VOLTAGE

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in electromagnetic field cause wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- No output signal from right front wheel sensor for one second.
- Excessive right front wheel speed sensor resistance for one second.

#### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 4-pin EBCM harness connector. Check resistance between 4-pin harness connector terminals "C" and "E". See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified, go to step 5). If not, go to next step.
3. Disconnect right WSS harness connector. Using a fused jumper wire, jumper sensor harness connector terminals "A" and "B". Using DVOM, check resistance between 4-pin EBCM harness connector terminals "C" and "E". If resistance is 0-2 ohms, go to next step. If not, go to step 10).

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4. Check resistance between right WSS harness connector terminals "A" and "B". See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified, go to step 7). If not, go to step 11).
5. Inspect 4-pin EBCM harness connector for signs of damage or corrosion. If damage is present, go to step 8). If no signs of damage are present, go to next step.
6. Reconnect all harness connectors. Test drive vehicle at speed greater than 15 MPH. If DTC C0021 sets, go to step 9). If not, go to next step.
7. Malfunction is intermittent. Check all connectors and harnesses for damage which may result in high resistance when components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Repair 4-pin EBCM harness connector. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in wheel speed sensor circuits between sensor and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
11. Replace wheel speed sensor. After replacing sensor, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

### WSS TEMPERATURE-VS-SENSOR RESISTANCE

Temperature °F (°C)	Ohms
AWD	
-40 To 40 (-40 To 4)	089-1630
41-110 (5-43)	1337-1900
111-200 (44-93)	1560-2230
201-302 (94-150)	1850-2651
2WD & 4WD	
-40 To 40 (-40 To 4)	920-1440
41-110 (5-43)	1125-1700
111-200 (44-93)	1305-2000
201-302 (94-150)	1530-2310

### DTC C0022: RIGHT FRONT WHEEL SPEED SENSOR SIGNAL MISSING

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed

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sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- Right front wheel speed is less than 4 MPH.
- All other wheel speeds are greater than 8 MPH.
- Unexpected wheel acceleration/deceleration. Anything that keeps the right front wheel speed sensor signal low while vehicle is moving at greater than 8 MPH.

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Inspect right front wheel speed sensor, sensor cable and connectors for signs of damage or corrosion. Inspect wheel sensor toothed ring for looseness. Inspect 4-pin EBCM harness connector. If any damage is found, go to step 7). If no damage is found, go to next step.
3. Raise and support vehicle. Disconnect right front WSS harness connector. Using DVOM, check resistance between sensor terminals "A" and "B". See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified, go to next step. If not, go to step 8).
4. Select AC scale on DVOM. Connect DVOM to sensor terminals "A" and "B". Spin wheel by hand while observing voltage reading on DVOM. If DVOM reads greater than 100 mV, go to next step. If not, go to step 8).
5. Disconnect 4-pin EBCM harness connector. Check resistance between harness connector terminals "C" and "E". If reading is infinite, go to next step. If reading is not infinite, go to step 10).
6. Reconnect all harness connectors. Test drive vehicle at speed greater than 15 MPH. If DTC C0022 sets, go to step 9). If not, go to step 11).
7. Make necessary repairs. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace right front wheel speed sensor. After replacing sensor, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair short between wheel speed sensor circuits. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
11. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

### DTC C0023: RIGHT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

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### Circuit Description

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- Average wheel speed for all wheel speed signals is greater than 25 MPH.
- Average right front wheel speed is greater than 25 MPH.
- No output from right front wheel speed signal for 15 milliseconds. Anything which suddenly prevents (intermittent) the right front wheel speed signal to drop to zero while vehicle is moving greater than 25 MPH.

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 4-pin EBCM harness connector and inspect for signs of corrosion or damage. Inspect wheel speed sensor, sensor cable and connectors for signs of damage or corrosion. If connections are okay, go to next step. If connections are damaged or corroded, go to step 6).
3. Using DVOM, check resistance between 4-pin EBCM harness connector terminals "C" and "E". Wiggle harness in various locations while monitoring DVOM reading. See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified and does not fluctuate, go to step 5). If not, go to next step.
4. Disconnect wheel speed sensor harness connector. Check resistance between wheel sensor terminals "A" and "B". See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified, go to step 7). If not, go to step 8).
5. Reconnect all harness connectors. Remove right front tire, hub and rotor. Verify right front wheel speed sensor is securely mounted and tone wheel is in good condition. If damage is not found, go to step 9). If damage is found, go to step 10).
6. Make necessary repairs. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open, short or high resistance in wheel speed sensor circuits. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace wheel speed sensor. After replacing sensor, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Make necessary repairs. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

**DTC C0025: LEFT FRONT WHEEL SPEED SENSOR CIRCUIT OPEN OR SHORTED TO BATTERY VOLTAGE**

**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

**Circuit Description**

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- No output signal from left front wheel sensor for one second.
- Excessive left front wheel speed sensor resistance for one second.

**Diagnostic Procedures**

1. Perform diagnostic system check. See [DIAGNOSTIC SYSTEM CHECK](#). After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 4-pin EBCM harness connector. Check resistance between 4-pin harness connector terminals "A" and "D". See [WSS TEMPERATURE-VS-SENSOR RESISTANCE](#) table. If resistance is as specified, go to step 5). If not, go to next step.
3. Disconnect left WSS harness connector. Using a fused jumper wire, jumper sensor harness connector terminals "A" and "B". Using DVOM, check resistance between 4-pin EBCM harness connector terminals "A" and "D". If sensor resistance is 0-2 ohms, go to next step. If not, go to step 10).
4. Check resistance between right WSS harness connector terminals "A" and "B". See [WSS TEMPERATURE-VS-SENSOR RESISTANCE](#) table. If resistance is as specified, go to step 7). If not, go to step 11).
5. Inspect 4-pin EBCM harness connector for signs of damage or corrosion. If damage is present, go to step 8). If no signs of damage are present, go to next step.
6. Reconnect all harness connectors. Test drive vehicle at speed greater than 15 MPH. If DTC C0025 sets, go to step 9). If not, go to next step.
7. Malfunction is intermittent. Check all connectors and harnesses for damage which may result in high resistance when components are connected. See [DIAGNOSTIC AIDS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
8. Repair 4-pin EBCM harness connector. After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
9. Replace EBCM. After replacing EBCM, perform [DIAGNOSTIC SYSTEM CHECK](#).
10. Repair open or high resistance in wheel speed sensor circuits. See [WIRING DIAGRAMS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
11. Replace wheel speed sensor. After replacing sensor, perform [DIAGNOSTIC SYSTEM CHECK](#).

**Diagnostic Aids**

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An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

### DTC C0026: LEFT FRONT WHEEL SPEED SENSOR SIGNAL MISSING

**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

#### Circuit Description

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- Left front wheel speed is less than 4 MPH.
- All other wheel speeds are greater than 8 MPH.
- No unexpected wheel acceleration/deceleration. Anything that keeps the left front wheel speed sensor signal low while vehicle is moving at greater than 8 MPH.

#### Diagnostic Procedures

1. Perform diagnostic system check. See [DIAGNOSTIC SYSTEM CHECK](#). After performing diagnostic system check, go to next step.
2. Turn ignition off. Inspect left front wheel speed sensor, sensor cable and connectors for signs of damage or corrosion. Inspect wheel sensor toothed ring for looseness. Inspect 4-pin EBCM harness connector. If any damage is found, go to step 7). If no damage is found, go to next step.
3. Raise and support vehicle. Disconnect left front WSS harness connector. Using DVOM, check resistance between sensor terminals "A" and "B". See [WSS TEMPERATURE-VS-SENSOR RESISTANCE](#) table. If resistance is as specified, go to next step. If not, go to step 8).
4. Select AC scale on DVOM. Connect DVOM to sensor terminals "A" and "B". Spin wheel by hand while observing voltage reading on DVOM. If DVOM reads greater than 100 mV, go to next step. If not, go to step 8).
5. Disconnect 4-pin EBCM harness connector. Check resistance between harness connector terminals "A" and "D". If reading is infinite, go to next step. If reading is not infinite, go to step 10).
6. Reconnect all harness connectors. Test drive vehicle at speed greater than 15 MPH. If DTC C0026 sets, go to step 9). If not, go to step 11).
7. Make necessary repairs. After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
8. Replace left front wheel speed sensor. After replacing sensor, perform [DIAGNOSTIC SYSTEM CHECK](#).
9. Replace EBCM. After replacing EBCM, perform [DIAGNOSTIC SYSTEM CHECK](#).
10. Repair short between wheel speed sensor circuits. See [WIRING DIAGRAMS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).

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11. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

### DTC C0027: LEFT FRONT WHEEL SPEED SENSOR SIGNAL ERRATIC

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- Average wheel speed for all wheel speed signals is greater than 25 MPH.
- Average left front wheel speed is greater than 25 MPH.
- No output from left front wheel speed signal for 15 milliseconds. Anything which suddenly prevents (intermittent) the right front wheel speed signal to drop to zero while vehicle is moving greater than 25 MPH.

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 4-pin EBCM harness connector and inspect for signs of corrosion or damage. Inspect wheel speed sensor, sensor cable and connectors for signs of damage or corrosion. If connections are okay, go to next step. If connections are damaged or corroded, go to step 6).
3. Using DVOM, check resistance between 4-pin EBCM harness connector terminals "A" and "D". Wiggle harness in various locations while monitoring DVOM reading. See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified and does not fluctuate, go to step 5). If not, go to next step.
4. Disconnect wheel speed sensor harness connector. Check resistance between wheel sensor terminals "A" and "B". See **WSS TEMPERATURE-VS-SENSOR RESISTANCE** table. If resistance is as specified, go to step 7). If not, go to step 8).
5. Reconnect all harness connectors. Remove left front tire, hub and rotor. Verify right front wheel speed sensor is securely mounted and tone wheel is in good condition. If damage is not found, go to step 9). If damage is found, go to step 10).

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6. Make necessary repairs. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open, short or high resistance between wheel speed sensor circuits. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace wheel speed sensor. After replacing sensor, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Make necessary repairs. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

### DTC C0029: SIMULTANEOUS DROPOUT OF FRONT WHEEL SPEED SENSOR SIGNALS

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- EBCM losing both front wheel speed signals when vehicle is at speeds greater than 12 MPH (brake released) or 20 MPH (brake applied).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 4-pin EBCM harness connector. Inspect harness connector and terminals for damage or corrosion. If harness or terminal is damaged or corroded, go to step 4). If harness and terminal are okay, go to next step.
3. Reconnect harness connector. Clear DTC. Road test vehicle at speeds greater than 15 MPH. Retrieve DTCs. If DTC C0029 resets, go to step 5). If DTC does not reset, go to step 6).
4. Make necessary repairs to harness connector or terminals. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
5. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
6. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

**DIAGNOSTIC SYSTEM CHECK .****Diagnostic Aids**

An intermittent malfunction may be caused by a poor connection, rubbed through wire insulation, or a wire broken inside the insulation. Also, check sensor terminals harness connectors.

**DTC C0035: REAR SPEED SENSOR SIGNAL CIRCUIT OPEN OR GROUNDED**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

**Circuit Description**

The rear wheel speed sensor signal originates from the VSS which is connected to the PCM/VCM. The EBCM receives the rear wheel speed sensor signal from the PCM/VCM.

Conditions for setting DTC:

- EBCM not seeing the correct voltage level from the PCM/VCM at start-up.

**Diagnostic Procedures**

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 10-pin EBCM harness connector. Turn ignition switch to RUN position. Check voltage between 10-pin EBCM harness connector terminal "E" and ground. If voltage is greater than 10 volts, go to step 4). If not, go to next step.
3. Turn ignition off. Disconnect PCM/VCM harness connector C1. Check resistance between 10-pin EBCM harness connector terminal "E" and PCM/VCM harness connector terminal No. 15. If resistance is 0-2 ohms, go to step 5). If not, go to step 8).
4. Turn ignition off. Reconnect PCM/VCM harness connector. Turn ignition switch to RUN position. Using scan tool, clear DTCs. Test drive vehicle at speed greater than 15 MPH. Check for DTCs. If DTC C0035 resets, go to step 6). If DTC does not reset, go to step 7).
5. Check resistance between 10-pin EBCM harness connector terminal "E" and ground. If resistance is infinite, check VSS. If resistance is not infinite, go to step 9).
6. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See **DIAGNOSTIC AIDS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Repair open in VSS signal circuit between VCM and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in VSS signal circuit. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

**Diagnostic Aids**

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This DTC can be set by a faulty VSS or a fault in VSS signal circuit.

### DTC C0036: REAR SPEED SENSOR SIGNAL MISSING

**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

#### Circuit Description

The rear wheel speed sensor signal originates from the VSS which is connected to the PCM/VCM. The EBCM receives the rear wheel speed sensor signal from the PCM/VCM.

Conditions for setting DTC:

- EBCM losing rear wheel speed signal for at least 5 seconds at speeds greater than 8 MPH with brake pedal released. If DTC C0035 is also present, diagnose that DTC first.

#### Diagnostic Procedures

1. Perform diagnostic system check. See [DIAGNOSTIC SYSTEM CHECK](#). After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 10-pin EBCM harness connector. Turn ignition switch to RUN position. Check voltage between 10-pin EBCM harness connector terminal "E" and ground. If voltage is greater than 10 volts, go to step 4). If not, go to next step.
3. Turn ignition off. Disconnect PCM/VCM harness connector C1. Check resistance between 10-pin EBCM harness connector terminal "E" and PCM/VCM harness connector terminal No. 15 (terminal No. 70 on 2.2L engines). If resistance is 0-2 ohms, go to step 5). If not, go to step 8).
4. Turn ignition off. Reconnect PCM/VCM harness connector. Turn ignition switch to RUN position. Using scan tool, clear DTCs. Test drive vehicle at speed greater than 15 MPH. Check for DTCs. If DTC C0036 resets, go to step 6). If DTC does not reset, go to step 7).
5. Check resistance between 10-pin EBCM harness connector terminal "E" and ground. If resistance is infinite, check VSS. If resistance is not infinite, go to step 9).
6. Replace EBCM. After replacing EBCM, perform [DIAGNOSTIC SYSTEM CHECK](#).
7. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See [DIAGNOSTIC AIDS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
8. Repair open in VSS signal circuit between VCM and EBCM. See [WIRING DIAGRAMS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
9. Repair short to ground in VSS signal circuit. After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).

#### Diagnostic Aids

This DTC can be set by a faulty VSS or a fault in VSS signal circuit between EBCM and VCM.

### DTC C0037: REAR SPEED SENSOR SIGNAL ERRATIC

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**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

### Circuit Description

The rear wheel speed sensor signal originates from the VSS which is connected to the VCM. The EBCM receives the rear wheel speed sensor signal from the VCM.

Conditions for setting DTC:

- EBCM seeing the rear speed signal line drop out and return. This DTC can be caused by a malfunction in the VSS or a fault in VSS signal circuit.

### Diagnostic Procedures

1. Perform diagnostic system check. See [DIAGNOSTIC SYSTEM CHECK](#). After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 10-pin EBCM harness connector. Turn ignition switch to RUN position. Check voltage between 10-pin EBCM harness connector terminal "E" and ground. If voltage is greater than 10 volts, go to step 4). If not, go to next step.
3. Turn ignition off. Disconnect VCM harness connector C1. Check resistance between 10-pin EBCM harness connector terminal "E" and VCM harness connector terminal No. 15 (VSS signal output circuit). If resistance is 0-2 ohms, go to step 5). If not, go to step 8).
4. Turn ignition off. Reconnect VCM harness connector. Turn ignition switch to RUN position. Using scan tool, clear DTCs. Test drive vehicle at speed greater than 15 MPH. Check for DTCs. If DTC C0037 resets, go to step 6). If DTC does not reset, go to step 7).
5. Check resistance between 10-pin EBCM harness connector terminal "E" and ground. If resistance is infinite, check VSS. If resistance is not infinite, go to step 9).
6. Replace EBCM. After replacing EBCM, perform [DIAGNOSTIC SYSTEM CHECK](#).
7. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when all components are connected. See [DIAGNOSTIC AIDS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
8. Repair open in VSS signal circuit between EBCM and VCM. See [WIRING DIAGRAMS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
9. Repair short to ground in VSS signal circuit. After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).

### Diagnostic Aids

This DTC can be set by a faulty VSS or a fault in VSS signal circuit between EBCM and VCM.

### DTC C0038: WHEEL SPEED SIGNAL MALFUNCTION

**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

### Circuit Description

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As a toothed ring passes by the Wheel Speed Sensor (WSS), changes in the electromagnetic field cause the wheel speed sensor to produce an AC voltage signal. Voltage signal frequency and amplitude are proportional to wheel speed. The magnitude of this signal is directly related to wheel speed and proximity of wheel speed sensor to toothed ring, often referred to as the air gap.

Conditions for setting DTC:

- Any wheel speed differing from the vehicle speed for any of the following causes:
  - One mismatched wheel speed more than double or less than half the other 3 wheel speeds.
  - All 4 wheel speeds differing from each other by 8 percent.
- Vehicle speed greater than 12 MPH.
- No unexpected wheel acceleration. Anything that generates consistent differences between wheel speed signals.

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Inspect vehicle tires for variation in tire size. If all 4 tires are the same, go to next step.
3. Clear DTCs using scan tool. Test drive vehicle. While test driving vehicle, use DATA LIST function on scan tool to monitor wheel speeds. If scan tool indicates a faulty sensor, go to affected DTC test to diagnose problem. If scan tool does not indicate a faulty sensor, problem is intermittent.

## DTC C0041: RIGHT FRONT ISOLATION SOLENOID CIRCUIT OPEN

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

When right front isolation solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will close isolation valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could cause loss of power to EBCM. If connector is okay, go to next step. If connector is not okay,

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go to step 6).

3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fusible link. If fusible link is open, go to step 9). If fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0042: RIGHT FRONT DUMP SOLENOID CIRCUIT OPEN

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

When right front dump solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open dump valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

#### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fusible link. If fusible link is open, go to step 9). If fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM**

**CHECK** .

7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS** . After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood duse/relay block and EBCM. See **WIRING DIAGRAMS** . After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

**DTC C0043: RIGHT FRONT ISOLATION SOLENOID CIRCUIT SHORTED**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

**Circuit Description**

When right front isolation solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will close isolation valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

**Diagnostic Procedures**

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK** . After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS** . After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood duse/relay block and EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

#### **DTC C0044: RIGHT FRONT DUMP SOLENOID CIRCUIT SHORTED**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

##### **Circuit Description**

When right front dump solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open dump valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

##### **Diagnostic Procedures**

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

#### **DTC C0045: LEFT FRONT ISOLATION SOLENOID CIRCUIT OPEN**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

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### Circuit Description

When left front isolation solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will close isolation valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0046: LEFT FRONT DUMP SOLENOID CIRCUIT OPEN

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

When left front dump solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open dump valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

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- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0047: LEFT FRONT ISOLATION SOLENOID CIRCUIT SHORTED

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

When left front isolation solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will close isolation valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- High voltage on EBCM solenoid driver circuit when expected to be low (solenoid not energized).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.

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2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0048: LEFT FRONT DUMP SOLENOID CIRCUIT SHORTED

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

When left front dump solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open dump valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- High voltage on EBCM solenoid driver circuit when expected to be low (solenoid not energized).

#### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.

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5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0051: REAR ISOLATION SOLENOID CIRCUIT SHORTED

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

When rear isolation solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will close isolation valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

#### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which can result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.

8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

**DTC C0052: REAR DUMP SOLENOID CIRCUIT OPEN**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

**Circuit Description**

When rear dump solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open dump valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

**Diagnostic Procedures**

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

## **DTC C0053: REAR ISOLATION SOLENOID CIRCUIT SHORTED**

**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

### **Circuit Description**

When rear isolation solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open isolation valve by magnetic force created by solenoid coil.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- Low voltage on EBCM solenoid driver circuit when expected to be high (solenoid not energized).

### **Diagnostic Procedures**

1. Perform diagnostic system check. See [DIAGNOSTIC SYSTEM CHECK](#). After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse is open, go to step 9). If fuse is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
7. Repair open or high resistance in ground circuit to EBCM. See [WIRING DIAGRAMS](#). After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform [DIAGNOSTIC SYSTEM CHECK](#).
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See [WIRING DIAGRAMS](#). After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform [DIAGNOSTIC SYSTEM CHECK](#).

## **DTC C0054: REAR DUMP SOLENOID CIRCUIT SHORTED**

**NOTE:** For circuit reference, see [WIRING DIAGRAMS](#).

### **Circuit Description**

When rear dump solenoid is needed, EBCM will ground solenoid circuit to energize coil within solenoid. This will open dump valve by magnetic force created by solenoid coil.

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Conditions for setting DTC:

- High voltage on EBCM solenoid driver circuit when expected to be low (solenoid not energized).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0065: PUMP MOTOR RELAY CIRCUIT OPEN

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

The relay supplies power to all 6 solenoid coils (3 isolation solenoid coils and 3 dump solenoid coils) when ABS is required. The relay and the 6 solenoid coils are located within the EBCM.

Conditions for setting DTC:

- EBCM microprocessor commands the relay on.
- Low voltage on all 8 solenoid driver circuits when all are expected to high (solenoid not energized).

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic

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system check, go to next step.

2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.
5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0066: PUMP MOTOR RELAY CIRCUIT SHORTED

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

The relay supplies power to pump motor when ABS is required. The relay is located within the EBCM.

Conditions for setting DTC:

- ANTI-LOCK indicator light check complete.
- High voltage on pump motor driver circuit when all are expected to low (relay not commanded on).

#### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could result in loss of power to EBCM. If connector is okay, go to next step. If connector is not okay, go to step 6).
3. Check resistance between ground and 2-pin EBCM harness connector terminal "B". If resistance is 0-2 ohms, go to next step. If not, go to step 7).
4. Check voltage between ground and 2-pin EBCM harness connector terminal "A". If voltage reading is greater than 10 volts, go to step 8). If not, go to next step.

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5. Inspect ABS fuse or fusible link. If fuse or fusible link is open, go to step 9). If fuse or fusible link is okay, go to step 10).
6. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair open or high resistance in ground circuit to EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
8. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0067: PUMP MOTOR CIRCUIT OPEN

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

The pump motor circuit is integral to EBCM. The EBCM energizes relay within EBCM to supply battery voltage to high side of pump motor. When pump motor activation is required, EBCM grounds low side of pump motor.

Conditions for setting DTC:

- EBCM internal relay on.
- Pump motor off.
- Low voltage from low side of pump motor when expected to be high.

#### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin pump motor pigtail connector from EBCM. Inspect connector and wiring for damage or corrosion that could cause an open circuit between pump motor and EBCM. If connector and wiring are okay, go to next step. If connector or wiring is faulty, go to step 10).
3. Check resistance between terminals No. 1 and 2 of 2-pin pump motor pigtail connector. If resistance is 0.1-0.3 ohm, go to step 15). If not, go to next step.
4. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could cause a loss of power to EBCM. If connector is okay, go to next step. If connector is faulty, go to step 9).
5. Check resistance between ground and terminal No. 2 of 2-pin EBCM harness connector. If resistance is 0-2 ohms, go to next step. If not, go to step 11).
6. Turn ignition switch to RUN position. Check voltage between ground and terminal No. 1 of EBCM harness connector. If voltage reading is 10 volts or greater, go to step 8). If not, go to next step.

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7. Check ABS fuse or fusible link. If fuse or fusible link is open, go to step 13). If fuse or fusible link is okay, go to step 14).
8. Inspect 2-pin EBCM harness connector for poor terminal contact or corrosion. Check for open in ground circuit to EBCM. See **WIRING DIAGRAMS**. Repair as necessary. Reconnect harness connectors. Using scan tool, clear DTC. Test drive vehicle at speed greater than 10 MPH. If DTC C0067 resets as current DTC, go to step 12). If DTC does not reset, malfunction is intermittent. See **DIAGNOSTIC AIDS**.
9. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair 2-pin pump motor pigtail connector or wiring. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
11. Repair open or high resistance in ground circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
12. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
13. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
14. Repair open or high resistance in battery circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
15. Replace BPMV assembly. After replacing assembly, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

Pump motor is integral with BPMV assembly and cannot be separately serviced. DTC C0067 can be caused by poor power and ground at the 2-pin EBCM or 2-pin motor harness from the EBCM to the pump motor. The EBCM or BPMV must be replaced if these tests show the pump motor EBCM internal circuitry has failed.

### DTC C0068: PUMP MOTOR LOCKED OR PUMP MOTOR CIRCUIT SHORTED

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

The pump motor circuit is integral to EBCM. The EBCM energizes the relay within EBCM to supply battery voltage to high side of pump motor. When pump motor activation is required, EBCM grounds low side of pump motor.

Conditions for setting DTC:

- Vehicle speed at 8 MPH or greater.
- EBCM internal relay on.
- Pump motor commanded on and then off.
- High voltage from low side of pump motor for 100 milliseconds when expected to be low.

### Diagnostic Procedures

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1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition off. Disconnect 2-pin pump motor pigtail connector from EBCM. Inspect connector and wiring for damage or corrosion that could cause an open circuit between pump motor and EBCM. If connector and wiring are okay, go to next step. If connector or wiring is faulty, go to step 10).
3. Check resistance between terminals No. 1 and 2 of 2-pin pump motor pigtail connector. If resistance is 0.1-0.3 ohm, go to step 15). If not, go to next step.
4. Disconnect 2-pin EBCM harness connector. Inspect connector for damage or corrosion which could cause a loss of power to EBCM. If connector is okay, go to next step. If connector is faulty, go to step 9).
5. Check resistance between ground and terminal No. 2 of 2-pin EBCM harness connector. If resistance is 0-2 ohms, go to next step. If not, go to step 11).
6. Turn ignition switch to RUN position. Check voltage between ground and terminal No. 1 of EBCM harness connector. If voltage reading is 10 volts or greater, go to step 8). If not, go to next step.
7. Check ABS fuse. If fuse is open, go to step 13). If fuse is okay, go to step 14).
8. Inspect 2-pin EBCM harness connector for poor terminal contact or corrosion. Check for open in ground circuit to EBCM. See **WIRING DIAGRAMS**. Repair as necessary. Reconnect harness connectors. Using scan tool, clear DTC. Test drive vehicle at speed greater than 10 MPH. If DTC C0068 resets as current DTC, go to step 12). If DTC does not reset, malfunction is intermittent. See **DIAGNOSTIC AIDS**.
9. Repair 2-pin EBCM harness connector as necessary. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
10. Repair 2-pin pump motor pigtail connector or wiring. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
11. Repair open or high resistance in ground circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
12. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
13. Repair short to ground in battery circuit between underhood fuse/relay block and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
14. Repair open or high resistance in ground circuit to EBCM. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
15. Replace BPMV assembly. After replacing assembly, perform **DIAGNOSTIC SYSTEM CHECK**.

### Diagnostic Aids

Pump motor is integral with BPMV assembly and cannot be separately serviced. DTC C0067 can be caused by poor power and ground at the 2-pin EBCM or 2-pin motor harness from the EBCM to the pump motor. The EBCM or BPMV must be replaced if these tests show the pump motor EBCM internal circuitry has failed.

### DTC C0071, C0072, C0073, C0074: EBCM INTERNAL FAULT

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### Circuit Description

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The EBCM initializes a self-test when ignition switch is turned to RUN position. The EBCM self-test verifies all internal circuitry within the EBCM is operating correctly.

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Using scan tool, attempt to clear DTCs. If DTCs cleared, go to next step. If not, go to step 4).
3. Check for history DTCs and data. If this is the first time DTC has set, perform **DIAGNOSTIC SYSTEM CHECK**. If DTC was set before, go to next step.
4. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.

### DTC C0081: STOPLIGHT SWITCH ALWAYS CLOSED OR SHORTED

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

#### Circuit Description

The stoplight switch is a normally closed switch. With ignition switch in the RUN position and brake pedal not depressed, ignition voltage will be present at the EBCM. When brakes are applied, the ignition voltage at the EBCM will be zero.

Conditions for setting DTC:

- Vehicle speed greater than 35 MPH for 10 seconds followed by vehicle at rest for one second.
- Stoplight switch never switching during the described condition.

### Diagnostic Procedures

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition on. Using scan tool, select DATA LIST function. Check the status of the stoplight switch while applying and releasing brake pedal. If scan tool indicates switch is closed (pedal not applied) at all times, go to next step. If not, go to step 4).
3. Turn ignition off. Disconnect stoplight switch connector. Turn ignition switch to RUN position. Using scan tool, check status of stoplight switch. If scan tool indicates switch is closed (pedal not applied), go to step 7). If not, go to step 8).
4. If scan tool indicates that switch is open (pedal applied) at all times, go to next step. If not, go to step 7).
5. Turn ignition off. Disconnect 10-pin EBCM harness connector. Turn ignition switch to RUN position. Using DVOM, check voltage between ground and terminal "C" of 10-pin EBCM harness connector. If voltage reading is greater than 10 volts, go to next step. If not, go to step 8).
6. Turn ignition off. Reconnect all harness connectors. Turn ignition switch to RUN position. Select DATA LIST function on scan tool. Using scan tool, check status of stoplight switch while applying and releasing brake pedal. If scan tool indicates switch is open (pedal applied) at all times, go to step 9). If not, go to next step.

7. Malfunction is intermittent. See **DIAGNOSTIC AIDS**. After performing necessary repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
8. Repair faulty stoplight switch or open in stoplight switch circuit between EBCM and stoplight switch. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
9. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.

**DTC C0086: ANTI-LOCK INDICATOR LIGHT CIRCUIT SHORTED TO BATTERY VOLTAGE**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

**Circuit Description**

The ANTI-LOCK indicator light is powered by ignition voltage through the GAUGE fuse. The EBCM output will be high (battery voltage) when indicator light is off, and will be low (ground) when light is on. If DTC C0086 sets, the EBCM will store the code in memory but will not disable the ABS. If DTC C0086 is in memory and a different fault occurs, EBCM will illuminate the BRAKE indicator light to notify operator of the problem.

Conditions for setting DTC:

- High voltage on ANTI-LOCK indicator light circuit when expected to be low (light commanded on).
- Anything that keeps the ANTI-LOCK indicator light circuit high when light is supposed to be illuminated, such as a short to voltage on ABS indicator light circuit between instrument cluster and EBCM. See **WIRING DIAGRAMS**.

**Diagnostic Procedures**

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition switch to RUN position and observe ANTI-LOCK indicator light operation. If indicator light illuminates and then turn off after 3 seconds, go to step 5). If not, go to next step.
3. Turn ignition off. Disconnect 10-pin EBCM harness connector. Using a fused (3-amp) jumper wire, jumper terminal "B" of 10-pin harness connector to ground. Turn ignition switch to RUN position. If ANTI-LOCK indicator light illuminates, go to step 6). If not, go to next step.
4. Inspect jumper wire fuse. If fuse is blown, go to step 7). If fuse is not blown, go to next step.
5. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when components are connected. See **DIAGNOSTIC AIDS**. After performing necessary repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
6. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair short to voltage in ANTI-LOCK indicator light circuit between instrument cluster and EBCM. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

**Diagnostic Aids**

DTC C0086 is typically set by a shorted ANTI-LOCK indicator light, although it can be set from a short to

voltage in the circuit between indicator light and EBCM, or a faulty EBCM.

## **DTC C0088: BRAKE WARNING LIGHT CIRCUIT SHORTED TO BATTERY VOLTAGE**

**NOTE:** For circuit reference, see **WIRING DIAGRAMS**.

### **Circuit Description**

The BRAKE warning light is powered by ignition voltage through the GAUGE fuse. The BRAKE warning light can be illuminated by the EBCM, Daytime Running Lights Module (DRL), brake pressure differential switch or by the park/stoplight switch. If DTC C0088 sets, the EBCM will store the code in memory but will not disable the ABS. If DTC C0086 is also in memory, the EBCM will not attempt to perform the bulb check at start-up.

Conditions for setting DTC:

- High voltage on BRAKE warning light circuit when expected to be low (light commanded on).
- Anything that keeps the BRAKE warning light circuit high when light is supposed to be illuminated, such as a short to voltage on BRAKE warning light control circuit.

### **Diagnostic Procedures**

1. Perform diagnostic system check. See **DIAGNOSTIC SYSTEM CHECK**. After performing diagnostic system check, go to next step.
2. Turn ignition switch to RUN position and observe BRAKE warning light operation. If indicator light illuminates and then turn off after 3 seconds, go to step 5). If not, go to next step.
3. Turn ignition off. Disconnect 10-pin EBCM harness connector. Using a fused (3-amp) jumper wire, jumper terminal "H" of 10-pin harness connector to ground. Turn ignition switch to RUN position. If BRAKE warning light illuminates, go to step 6). If not, go to next step.
4. Inspect jumper wire fuse. If fuse is blown, go to step 7). If fuse is not blown, go to next step.
5. Malfunction is intermittent. Inspect all connectors and harnesses for damage which may result in high resistance when components are connected. See **DIAGNOSTIC AIDS**. After performing necessary repairs, perform **DIAGNOSTIC SYSTEM CHECK**.
6. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
7. Repair short to voltage in BRAKE warning light circuit. See **WIRING DIAGRAMS**. After repairs, perform **DIAGNOSTIC SYSTEM CHECK**.

### **Diagnostic Aids**

DTC C0088 is typically set by a shorted BRAKE warning light, although it can be set from a short to voltage in the circuit between indicator light and EBCM, or a faulty EBCM.

## **SYMPTOM TESTS**

### **TEST A: ANTI-LOCK LIGHT DOES NOT ILLUMINATE - NO DTCS**

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**NOTE:** For circuit reference, see WIRING DIAGRAMS.

### Circuit Description

The EBCM controls the ANTI-LOCK indicator light by supplying ground to turn on or battery voltage to turn off the indicator light.

If indicator light is off constantly, check for an open or short to voltage in the light circuit between indicator light and EBCM. Also check for open in GAUGES fuse or faulty light bulb.

### Diagnostic Procedures

1. Perform Diagnostic System Check. If diagnostic system check has been performed, go to next step. If not, go to DIAGNOSTIC SYSTEM CHECK.
2. Turn ignition off. Disconnect 10-pin EBCM harness connector. Using a fused jumper wire, jumper terminal "B" of 10-pin harness connector to ground. Turn ignition switch to RUN position. If ANTI-LOCK indicator light illuminates, go to next step. If not, go to step 4).
3. Inspect 10-pin EBCM harness connector for damage or corrosion. If connector is okay, go to step 9). If connector is not okay, go to step 8).
4. Inspect jumper wire fuse. If fuse is blown, go to step 10). If fuse is okay, go to next step.
5. Inspect 10-amp GAUGE fuse. If fuse is blown, go to next step. If fuse is okay, go to step 7).
6. Turn ignition off. Replace fuse. Turn ignition switch to RUN position. Remove and inspect GAUGE fuse. If fuse is blown, go to step 13). If fuse is okay, go to step 14).
7. Remove and inspect ANTI-LOCK indicator light bulb. If bulb is okay, go to step 12). If bulb is faulty, go to step 11).
8. Repair 10-pin EBCM harness connector. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
9. Replace EBCM. After replacing EBCM, perform DIAGNOSTIC SYSTEM CHECK.
10. Repair short to voltage in ANTI-LOCK indicator light circuit between EBCM and instrument cluster. See WIRING DIAGRAMS. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
11. Replace ANTI-LOCK indicator light bulb. After replacing light bulb, perform DIAGNOSTIC SYSTEM CHECK.
12. Repair open in circuit between fuse block and instrument cluster, or ANTI-LOCK indicator light control circuit between instrument cluster and EBCM. See WIRING DIAGRAMS. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
13. Repair short to ground in brake warning light control circuit between instrument cluster and EBCM. See WIRING DIAGRAMS. After repairs, perform DIAGNOSTIC SYSTEM CHECK.
14. Problem is an intermittent short to ground in brake warning light control circuit between instrument cluster and EBCM. See WIRING DIAGRAM. Repair as necessary. After repairs, perform DIAGNOSTIC SYSTEM CHECK.

### TEST B: ANTI-LOCK LIGHT IS ON AT ALL TIMES - NO DTCS

**NOTE:** For circuit reference, see WIRING DIAGRAMS.

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### Circuit Description

The EBCM controls the ANTI-LOCK indicator light by supplying ground to turn on or battery voltage to turn off the indicator light.

If indicator light is on constantly, check for short to ground in the light circuit between indicator light and EBCM, or EBCM is not capable of turning off indicator light.

### Diagnostic Procedures

1. Perform Diagnostic System Check. If diagnostic system check has been performed, go to next step. If not, go to **DIAGNOSTIC SYSTEM CHECK**.
2. Turn ignition off. Disconnect 10-pin EBCM harness connector from EBCM. Turn ignition switch to RUN position. If ANTI-LOCK indicator light illuminates and stays illuminated, go to step 4). If not, go to next step.
3. Replace EBCM. After replacing EBCM, perform **DIAGNOSTIC SYSTEM CHECK**.
4. Repair short to ground in ANTI-LOCK indicator light control circuit between instrument cluster and EBCM. See **WIRING DIAGRAMS**. After repairs, perform DIAGNOSTIC SYSTEM CHECK.

## REMOVAL & INSTALLATION

**CAUTION:** When battery is disconnected, vehicle computer and memory systems may lose memory data. Driveability problems may exist until computer systems have completed a relearn cycle. See COMPUTER RELEARN PROCEDURES article in GENERAL INFORMATION before disconnecting battery.

### BRAKE PRESSURE MODULATOR VALVE & COMBINATION VALVE

#### Removal & Installation

1. Disconnect negative battery terminal. Remove bolts to shield and mounting bracket to BPMV and EBCM. Disconnect harness connector from BPMV. Remove brake lines from BPMV. Remove bolts to separate combination valve and BPMV. Remove 2 transfer tubes.

**NOTE:** **DO NOT reuse transfer tubes.**

2. To install, reverse removal procedure. Bleed brake system, including BPMV. See **BLEEDING BRAKE SYSTEM**. DO NOT overtighten BPMV-to-bracket bolts during installation. This may cause excessive noise transfer into vehicle. See **TORQUE SPECIFICATIONS**.

### ELECTRONIC BRAKE CONTROL MODULE

#### Removal & Installation

1. Disconnect negative battery terminal. Disconnect harness connector from EBCM and combination valve.

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Remove 4 module retaining screws.

2. To install, reverse removal procedure. DO NOT use RTV or any other type of sealant on EBCM gasket or mating surfaces.

### FRONT WHEEL SPEED SENSOR

**NOTE:** **For installation purposes, note speed sensor wire routing before removing. Misrouted wiring may cause electromagnetic interference failures.**

#### Removal & Installation (2WD)

1. Remove wheel. Remove brake caliper and wire aside. Remove hub and rotor. Disconnect speed sensor connector. Remove splash shield and speed sensor assembly. To install, reverse removal procedure. Tighten wheel bearing nut to 12 ft. lbs. (16 N.m), then back off until just loose.
2. Hand tighten wheel bearing nut. Back off wheel bearing nut no more than 1/2 of a flat, until hole in spindle aligns with slot in wheel bearing nut. If wheel bearing nut is adjusted properly, hub end play should be .001-.005" (.03-.13 mm). If hub end play is not within specification, repeat procedure. Speed sensor air gap is non-adjustable.

#### Removal & Installation (4WD)

1. Remove wheel. Remove brake caliper and wire aside. Remove drive axle nut. Disconnect speed sensor electrical connector. Remove speed sensor wire from clip on upper control arm. Remove bolts retaining hub and bearing. Remove splash shield bolts. Using a puller, remove hub and bearing.
2. Remove splash shield and speed sensor assembly. Remove speed sensor from splash shield. Remove speed sensor wire harness from splash shield. To install, reverse removal procedure. Ensure drive axle nut is properly tightened.
3. DO NOT move drive axle nut more than 1/6 of a turn to align cotter pin. If speed sensor is being replaced, drill out rivet in splash shield, and replace rivet with a small bolt, nut and washer. Speed sensor air gap is non-adjustable.

### VEHICLE SPEED SENSOR

#### Removal & Installation

1. Vehicle Speed Sensor (VSS) is located in left rear of transmission (2WD) or transfer case (4WD). Ensure ignition is off. Raise and support vehicle. Disconnect VSS electrical connector. Place a container under VSS mounting area to catch transmission fluid when VSS is removed.
2. Remove VSS mounting bolt. Remove VSS and "O" ring using J-38417. To install, coat NEW "O" ring with transmission fluid. Install "O" ring onto VSS. Install VSS and "O" ring into transmission using J-38417. Tighten mounting nuts or bolts to specification. See **TORQUE SPECIFICATIONS** table.

### TORQUE SPECIFICATIONS

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## 1997 Chevrolet S10 Pickup

ANTI-LOCK BRAKE SYSTEM 1997 BRAKES General Motors Corp. - Anti-Lock - 4WAL

Application	Ft. Lbs. (N.m)
Axle Nut (4WD)	103 (140)
BPMV Bracket-To-Body Bolt	21 (28)
Brake Caliper Mounting Bolt	37 (50)
Brakeline-To-Combination Valve	22 (29)
Front & Rear	22 (29)
Combination Valve-To-BPMV	12 (16)
Front Wheel Speed Sensor Mounting Bolt <sup>(1)</sup>	
2WD	19 (26)
4WD	13 (18)
Splash Shield Bolt	12 (16)
Tube Adapters-To-BPMV	23 (31)
Wheel Bearing Nut (2WD) <sup>(2)</sup>	12 (16)
Wheel Lug Nut	95 (129)
INCH Lbs. (N.m)	
EBCM-To-BPMV	39 (5)
Speed Sensor Harness Clip Bolt	9 (12)

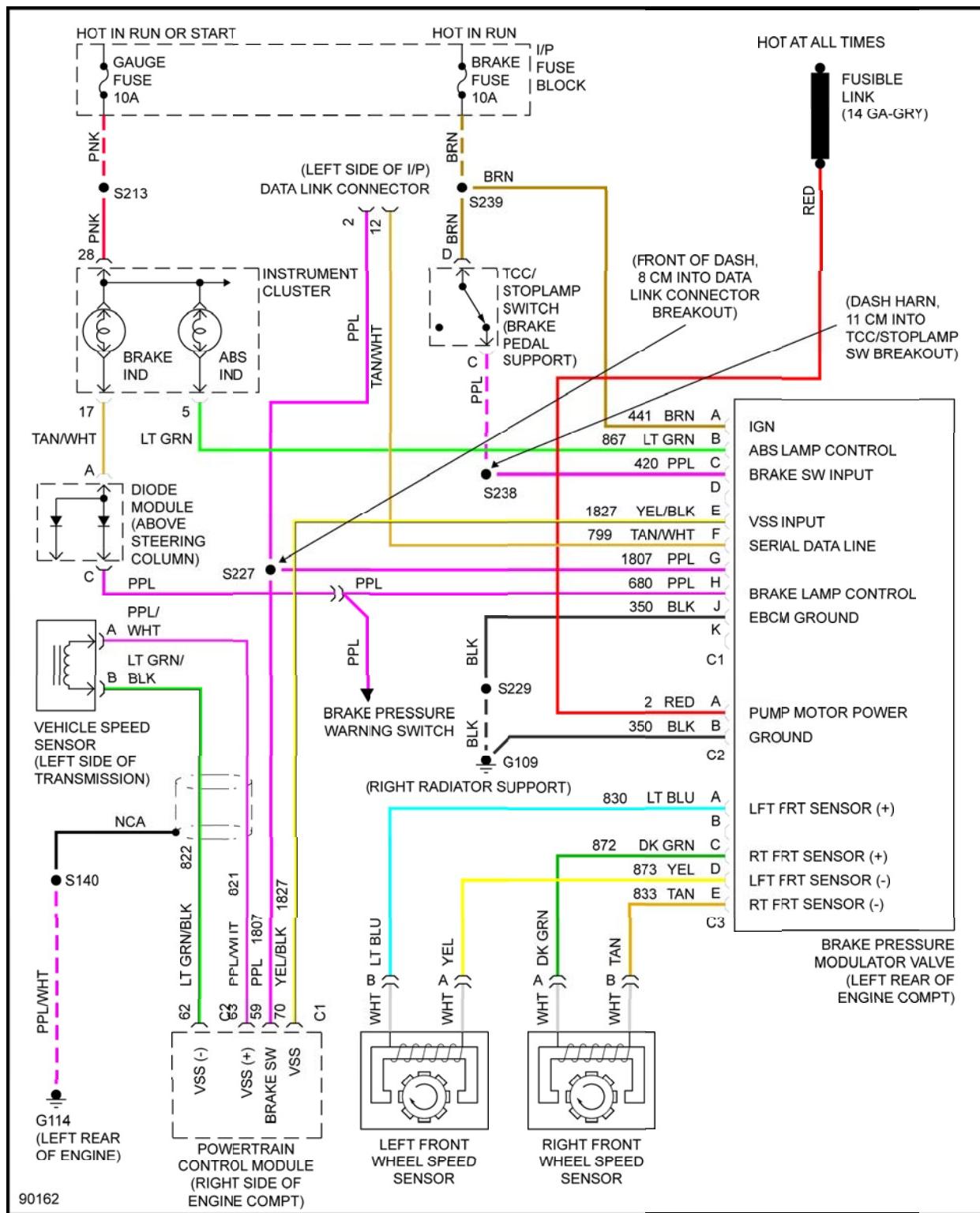
(1) Not all models have speed sensor mounting bolts. Some models have a speed sensor which is mounted on splash shield.

(2) See FRONT WHEEL SPEED SENSOR under REMOVAL & INSTALLATION for proper adjustment.

## WIRING DIAGRAMS

## **1997 Chevrolet S10 Pickup**

ANTI-LOCK BRAKE SYSTEM 1997 BRAKES General Motors Corp. - Anti-Lock - 4WAL



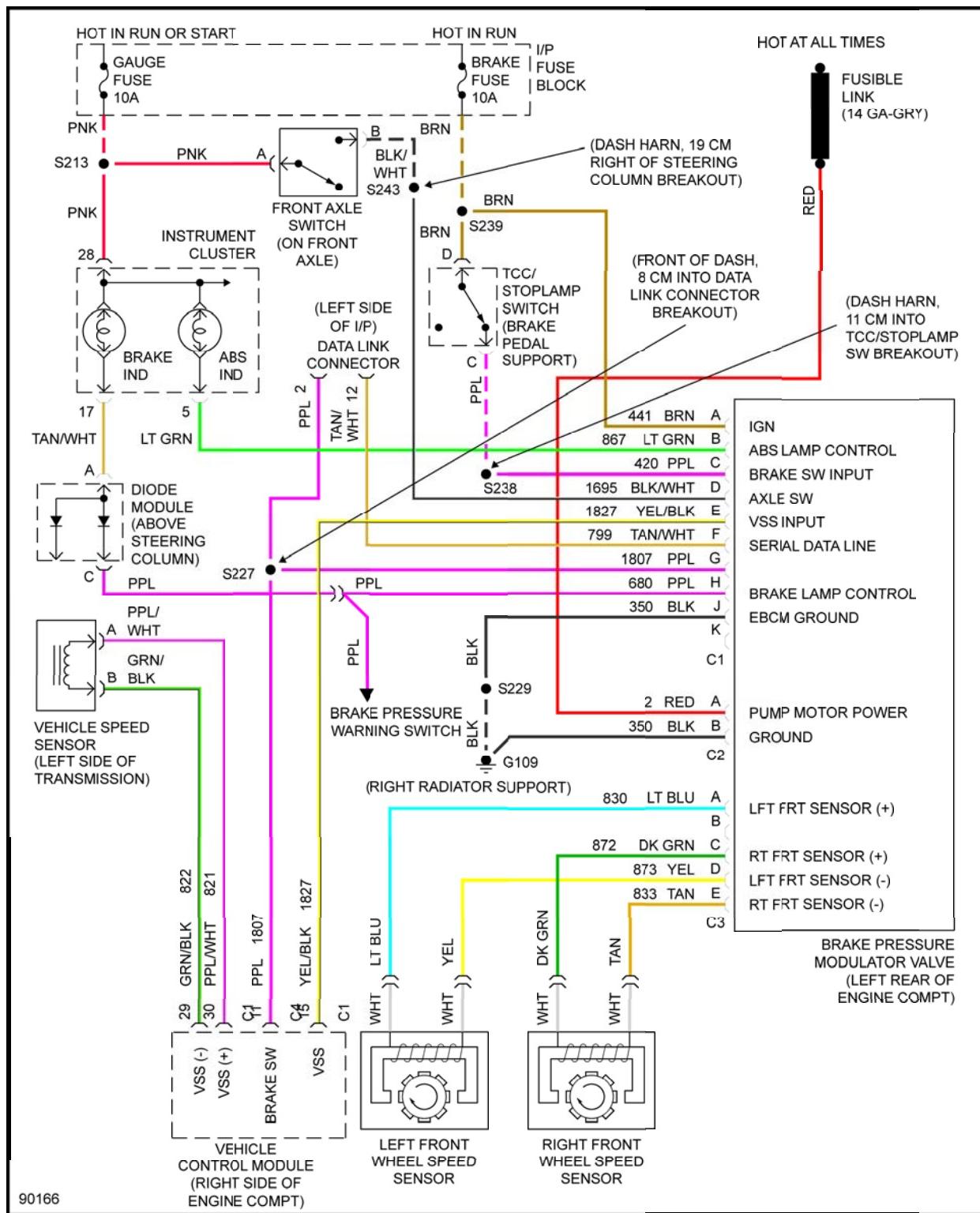
## **1997 Chevrolet S10 Pickup**

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**Fig. 1: 4WAL Brake System Wiring Diagram (2.2L)**

## **1997 Chevrolet S10 Pickup**

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## **1997 Chevrolet S10 Pickup**

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**Fig. 2: 4WAL Brake System Wiring Diagram (4.3L)**